

Dockyards and dockland

Industry Profiles, together with the Contaminated Land Research Report series, are financed under the Department of the Environment's contaminated land research programme.

The purpose of these publications is to provide regulators, developers and other interested parties with authoritative and researched advice on how best to identify, assess and tackle the problems associated with land contamination. The publications cannot address the specific circumstances of each site, since every site is unique. Anyone using the information in a publication must, therefore, make appropriate and specific assessments of any particular site or group of sites. Neither the Department or the contractor it employs can accept liabilities resulting from the use or interpretation of the contents of the publications.

The Department's Contaminated Land Research Report series deals with information needed to assess risks; procedures for categorising and assessing risks; and evaluation and selection of remedial measures.

General guidance on assessing contaminated land and developing remedial solutions which is complementary to the Department's publications is provided by the Construction Industry Research and Information Association (CIRIA).

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DOE Industry Profile

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Preface

DOE Industry Profiles provide developers, local authorities and anyone else interested in contaminated land, with information on the processes, materials and wastes associated with individual industries. They are not definitive studies but they introduce some of the technical considerations that need to be borne in mind at the start of an investigation for possible contamination.

Every site is unique. Investigation of a site should begin with documentary research to establish past uses. Information on the site's history helps to focus a more detailed investigation. This knowledge needs to be supplemented by information on the type of contamination that may be present and where on site it may be found. Profiles give information on the contamination which might be associated with specific industries, factors that affect the likely presence of contamination, the effect of mobility of contaminants and guidance on potential contaminants.

The date when industrial practices first commenced on a site and its location are important clues in establishing the types of operations that may have taken place, so each profile provides a summary of the history of the industry and its likely geographical spread within the United Kingdom.

Profiles should be read with the following reservations in mind:

- individual sites will not necessarily have all of the characteristics described in the profile of that industry;

- practices can vary between sites and change over time;

- as practices change, problems of possible contamination may also change;

- the profile may refer to practices which are no longer followed, and may omit current practices which avoid contamination.

The risks presented by contaminated sites depend on the nature of the contaminants, the targets to which they are a potential threat (such as humans or groundwater) and the routes or pathways by which they reach these targets. The current or proposed use of a site and its environmental setting are crucial in deciding whether treatment is necessary and if so, the methods to be used. Some sites may not need treatment.

The information in profiles may help in carrying out Control of Substances Hazardous to Health (COSHH) assessments for work on contaminated land - see Health and Safety Guidance Note HS(G) 66 *Protection of workers and the general public during the development of contaminated land*, Health and Safety Executive, 1991, and *A guide to safe working practices for contaminated sites*, Construction Industry Research and Information Association, 1995.

Note: the chemical names given to substances in this profile are often not the modern chemical nomenclature, but the names used historically for those substances.

Dockyards and dockland

1. Background

This profile covers the activities and potential sources of contamination in dockyard areas. It does not include naval dockyards and dockland used for specific industrial processes such as shipbuilding and other engineering operations. These are covered in other Industry Profiles (see Section 4).

Ports, harbours and docks are intended to provide facilities for:

- safe and economical transfer of cargo and passengers
- the fishing industry
- refuge for ships and small craft
- mooring and repair of all sea-going vessels.

This profile does not deal with individual ports; it describes only the broad trends in developments across the country and gives examples to illustrate the key events that have taken place. The history of a port is likely to show that different activities were carried out at different periods. A detailed study should be undertaken to establish its construction, types of cargo handled, the storage facilities that have been used and the industries that grew up in connection with it.

1.1 History and location

London was the major port in Britain in Roman, Anglo-Saxon and Medieval times. The centre of port activities was moved down the River Thames following an Act of Parliament of 1558 which required all cargo to pass through official customs below London Bridge.

During the 17th Century London handled 70-80% of the nation's overseas trade. London's docks at this time were entirely tidal. Ships had to wait in the middle of the river for space at wharves or they had to rest at low tide on barge beds. To ease congestion, the 'wet dock' was introduced, first in Blackwall in about 1680 and later in Rotherhithe in 1700. A wet dock comprises of an area of enclosed water maintained at a constant level, into which ships pass through controlling gates. Once a ship is in wet dock, its cargo can be transferred safely and quickly to the shore and to a warehouse.

The principle of using wet docks soon spread to other ports. Bristol developed considerably in the 16th and 17th Centuries because of its trade with America. A wet dock was completed in the Avon estuary in 1712. Bristol did not, however, become as big a port as London.

Other ports developed on the west coast of Britain to serve the Transatlantic trade, in particular Liverpool. Liverpool became the major port for emigration to North America and the major port of entry for North American agricultural products. By 1870 Liverpool had about 10km of docks and harbours.

The number, size and character of ports was profoundly altered by Britain becoming the world's first modern industrial power. At the height of its industrial

pre-eminence, in the middle of the 19th Century, Britain made over 40% of the manufactured goods in world trade and over a quarter of all international trade passed through her ports. Most of Britain's exports consisted of manufactured goods but coal was also shipped overseas in huge quantities. Indeed, some ports in South Wales and North East England were dedicated solely to exporting coal. Imports consisted of raw materials for Britain's factories (eg mineral ores, cotton, timber and, later, rubber) and food for the populations of the new industrial towns. Liverpool, Glasgow, Hull and Manchester overtook Bristol in importance, but did not reach the size of London.

The improvement of inland communications was a factor in the development of a number of ports in the 19th Century. For example, the growth of the canal network led ports to develop at Grangemouth and Goole, and the expansion of the railways led to the development of Southampton, Blyth and Holyhead.

The land adjacent to docks was often developed by industrial and commercial enterprises, with the docks providing an outlet for their produce. The type of port in the surrounding area has therefore had a considerable influence on the infrastructure and industrial processes which may have been associated with the dockland. These can vary considerably and include:

- oil ports such as Milford Haven
- coal ports in South Wales with their associated smelting and gas production industries
- shipbuilding and repair ports on the Clyde, Tyne and Tees
- general cargo ports such as Liverpool and London.

In the 20th Century, ports in Britain have had a chequered history. Patterns of trade have changed, notably the Transatlantic trade has declined, and trade with Europe has increased. Ports like Dover and Felixstowe have benefitted by the increase of trade with the member states of the European Union. Important cargoes today include petroleum products, chemicals, metals, paper products and manufactured goods.

There have been important changes in technology since the Second World War. Beginning in the early 1950s, there was a dramatic move to carrying cargoes in containers. The 'container revolution' was virtually responsible for the creation of Felixstowe. Roll-on roll-off ships have also had a significant impact on the nature of port operations.

Major ports have often been able to survive because they have the capacity to handle the very large vessels which are now used. However, some small ports were at a disadvantage because they were unable to cope with the rapid change in cargo handling techniques.

The decline in the fortune of many ports and their related industries has led to large expanses of dockland being left derelict. The establishment of dockland development corporations, notably in London and Liverpool, has led to the re-use and development of dockland areas for light industry, office and residential purposes.

There are currently more than 300 ports and harbours in Britain, ranging from small river wharves and fishing ports to major dock complexes such as Liverpool, Felixstowe and London. Over 90% of Britain's external trade passes through its ports. In spite of recent changes, they remain as important as ever.

2. Activities

2.1 Construction materials

Dockland is typically located in low-lying areas, often on reclaimed marshland. Various types of fill material may have been used in the construction of docks. They include waste materials from the local area, for example industrial waste, furnace ash, building rubble, dock silts and marine dredgings. The industrial history of the surrounding area can provide an important guide to the range of contaminants that may be expected.

Maintenance operations and redevelopment of dockland areas often require the removal of silts from the docks.

2.2 Cargo handling

A large variety of handling systems and transfer methods has been, and is currently, employed for containerised as well as dry and liquid bulk cargoes. The majority of cargo is now moved in bulk by specialised carriers serviced at bulk terminals. The principle of maximising the continuity of flow has led to a reduction in the dock handling and storage facilities necessary for the cargo.

Historically, dry bulk cargo has been handled by open conveyors, hoppers, hoists, grab cranes and other mobile plant, creating considerable possibilities for spillage and the spread of contaminated wind-blown dusts. Slurry systems involving suction or pumping of solids are now increasingly employed, with less associated contamination risk, but spillage and airborne dust may still occur.

In the past, liquid bulk cargo was usually contained and transferred in drums or bulk tanks, but pumping via pipelines has become increasingly common. Spills and leakage at dockside storage were, and remain, frequent.

A wide variety of cargoes are likely to have been handled in most dockland areas at some point in their history (eg coal, petroleum products, grain, meat, but many of the materials were for specific local industries. Ports had their particular specialities and sometimes individual docks were equipped to handle specific cargoes (eg ores, timber, coal); specialities may have changed over time.

2.3 Storage facilities

The majority of docks necessarily have a large proportion of their area allocated to storage purposes, with transit sheds, warehouses and other buildings protecting cargoes from exposure to the weather. Refrigerated storage of foodstuffs involves usage of refrigerating agents such as ammonia, sodium hydroxide, brine and calcium chloride solutions, freon and other chlorofluorocarbon (CFC) compounds.

2.4 Ancillary operations

A range of ancillary operations were present in most dockland areas. These may have included large coke and coal yards and oil and petrol stores, for the bunkering of vessels and fuelling of dockside vehicles. Some dockland also had its own gas works, which were generally smaller than town gas plants but with similar waste products (see the related Industry Profiles in Section 4).

Other ancillary activities may have included:

- ship repair
- tank cleaning installations
- timber protection and treatment for ships
- rope and hemp works (tar and pitch waterproofing)
- sail and canvas making (tar and pitch waterproofing)
- iron and brass foundries
- metal finishing and plating shops
- spray asbestos shops for ships' fire-protection
- copper and steel shops
- paint shops including antifouling/antirust protection (lead and tin-based treatments).

Many sites made use of on-site waste disposal to accommodate the wastes from these activities as well as 'spoiled' and spilled cargoes.

2.5 Local industries

Particular dockland and port areas were strongly associated with specific local industries whose raw materials and products they handled. Once the specific industries have been identified, details of possible contaminants may be obtained by referring to the relevant Industry Profile in this series (see Section 4).

3. Contamination

The contaminants on a site will largely depend on the history of the site and on the range of materials present there. Potential contaminants are listed in the Annex. It is most unlikely that any one site will contain all of the contaminants listed. It is recommended that an appropriate site investigation be carried out to determine the exact nature of the contamination associated with individual sites.

3.1 Factors affecting contamination

Where a port is located at the mouth of a river, dredgings may contain contaminants that originated in discharges from industries up river.

It is characteristic of dock dredgings that they concentrate certain contaminants. This presents a problem where dredgings have been used to reclaim land or as infill for dock construction. Problems may arise in relation to their disposal, particularly where they have lain undisturbed for a long time. Metal contamination of dredgings is common since metals are associated with deposited solids and may be largely insoluble within the aquatic environment. Generally, a wide range of metals and metalloids may be present in dredgings including lead, zinc, cadmium,

copper, chromium, tin and arsenic; less common metals such as molybdenum and beryllium may also occur. In addition, accumulation of insoluble contaminants from products such as paints may have occurred. Knowledge of the particular historical characteristics of an area is important, for example some estuaries in North West England are known to be rich in mercury and some in Scotland contain dock dredgings with high levels of cadmium and lead.

Underlying peat and organic clays and silts can be sources of gases such as methane or hydrogen sulphide. Gas generation and migration may occur owing to changes to the water regime, increases in compaction caused by infilling and construction, and by the leakage of basin water through dock walls into the subsoil. Gases can also be released from deeper layers by the puncturing action of construction works. For example, during investigation of the area of the Greenland Dock in Rotherhithe, boreholing works hit a pocket of methane gas which ignited. Appropriate protection against methane and other gases is therefore an important aspect both during investigation and redevelopment of dockland.

The areas with the greatest potential for contamination are the larger wharves where space was available for extensive stockpiling and for engineering operations including processing and manufacturing activities such as shipbuilding and breaking (see Section 4). Contamination associated with cargo-handling plant and equipment is likely to consist largely of fuel and oil waste from hydraulic equipment, diesel engines etc. Waste from ancillary power stations (small gas works and coal carbonisation plants) and from other ancillary activities is mentioned in Section 2.4.

Spillages and leaks of cargo materials in transfer and storage areas are a potential source of contamination. Housekeeping in such areas has tended to be poor, with little hard surfacing to protect the soil and groundwater from contamination. However, groundwater is likely to be less sensitive to contamination in docks and port areas because its salinity renders it non-potable. The major bulk commodities with the potential to cause contamination include petroleum products, coal and coke, metal ores and powders, bulk fertilisers and other bulk chemicals. Large coke and coal yards for the fuelling of vessels were a feature of most dockland. Oil tankage may also have been substantial, with oil and petrol stores distributed around the site. Radioactive material may be encountered, for example, as a result of ore-handling. Extensive railway networks are often associated with dockland and are a guide as to where cargo may have been spilt.

The careless disposal of ships' wastes (eg galley waste and fuel waste), as well as petroleum and other cargoes, are another potential source of contamination of both land and water. Chemicals such as dispersing agents used to treat oil and petroleum spillages on water may have caused contamination in storage areas.

Ports and docks were often the targets of bombing raids in the Second World War, consequently unexploded bombs, incendiary devices and similar hazards may be present on site.

Electrical equipment such as transformers may have used polychlorinated biphenyls (PCBs) as dielectric fluids; leakage of these may have occurred during refilling or decommissioning.

Contamination may originate from materials used for the construction, maintenance and operation of the storage facilities. Asbestos and other insulating fibres may be associated with pipework and buildings.

Other potential contaminants include fuel waste, cleaning agents, paint residues (including toxic antifouling compounds) and hydraulic fluids.

3.2 Migration and persistence of contaminants

3.2.1 Metals

Metal contamination is likely to be closely related to the locations of specific deposits except where leaching has occurred. The movement of metals through the soil is significantly retarded by the presence of clay minerals and organic matter and by solubility constraints. The solubility of some metals (eg copper, zinc and lead) may increase under acidic conditions. In other cases the relationship is more complex. For example, trivalent chromium is more soluble under acidic conditions, whereas the solubility of hexavalent chromium is increased under both acidic and alkaline conditions. Arsenic may become more soluble at higher pH. The presence of solvents will also enhance metal mobility. Metals in surface or near-surface soils may also be transported across a site by wind action. Disturbance or removal of dredgings can result in mobilisation of metals and other contaminants, as well as de-oxygenation of the water body, which may have a detrimental effect on aquatic flora and fauna.

3.2.2 Organic compounds

Relatively small amounts of organic liquids, such as oils, fuels and solvents, pose a considerable threat to water quality, both through surface run-off and groundwater infiltration. The less soluble compounds which become adsorbed on to clay or organic matter may provide on-going sources of water pollution long after the original source has been removed, by continuing to allow the contaminant to slowly desorb into the soil-water. Generally, the higher the organic matter and clay content of the soil, the greater the adsorption of solvents and the lower their mobility. Conversely, the greatest migration of contaminants occurs in coarse-grained sands and gravels with little organic matter.

The non-chlorinated solvents are generally less dense than water and the non-soluble components float on the water-table. Most compounds within this group are potentially biodegradable but may persist in soil because of unfavourable conditions for microbial activity.

Biodegradation processes in soils can be influenced by a number of factors, namely moisture content, oxygen concentration and pH, acting separately or in combination. For example low moisture content reduces microbiological activity, while high moisture content can reduce oxygen penetration and possibly lead to anaerobic soil conditions. Such conditions enhance the biodegradation of some materials, eg chlorinated compounds, while aerobic conditions are needed to biodegrade many oils. Also, low pHs tend to reduce the bacterial population and encourage fungal activity; at pHs lower than 5 microbiological activity is much reduced. The presence of heavy metals also inhibits micro-organisms. As a result of these factors, at high concentrations in soil, even relatively non-persistent compounds may not biodegrade readily.

Chlorinated solvents can contaminate water at very low concentrations. They are generally more dense than water and tend to migrate to the bottom of aquifers. Their movement may not be consistent with the groundwater flow. Chlorinated solvents are persistent; they degrade slowly and only under specific conditions.

Organic solvents may also increase the solubility of which are insoluble in water but soluble in such solvents, and increase the potential for groundwater contamination.

Phenols are very mobile, particularly phenol itself which is very soluble and can migrate considerable distances from its source. Phenols can also permeate water supply pipes manufactured from polymeric materials such as polyvinyl chloride (PVC) and can attack the PVC or plastic sealing compounds in joints of metal pipes.

PCBs have a low solubility in water and do not degrade. They are fat-soluble and tend to accumulate in food chains.

3.2.3 Inorganic compounds

Soluble inorganic contaminants can percolate through the soil to contaminate groundwater or contaminate surface waters through surface run-off. Mineral acids migrate within soil-water in the dissociated form, ie as the hydrogen ion and the corresponding anion (eg nitrate or sulphate). The buffering capacity of most soils tends to neutralise slight acidity. Dissolved nitrate and sulphate migrate fairly freely through the soil. Acid spillage near buildings may effect the integrity of concrete, as may the presence of sulphates.

Asbestos is neither soluble nor biodegradable and persists in soil. Widespread contamination of a site may occur through wind-blown dispersion of surface deposits containing loose asbestos fibres.

3.2.4 Other factors

Gases such as methane, hydrogen sulphide and volatile solvents may migrate through permeable soils.

4. Sources of further information

4.1 Organisations

For information concerning dockyards in the United Kingdom, the following organisations should be consulted:

Associated British Ports Holdings plc
150 Holborn
London
EC1N 2LR

British Ports Association
Room 217
Africa House
64-78 Kingsway
London
WC2B 6AB

British Waterways Board
Melbury House
Melbury Terrace
London
NW1 6JX

Department of Transport
Ports Division
1st Floor
Great Minister House
76 Marsham Street
London
SW11 4DR

UK Independent Ports Association
c/o Port of Felixstowe Ltd
Tomline House
The Dock
Felixstowe
Suffolk
IP11 8SY

United Kingdom Major Ports Group Ltd
150 Holborn
London
EC1N 2LR

4.2 Sources of information concerning the activities described in this profile

Associated British Ports. *Background information paper.* London, 1993.

Associated British Ports. *Ports – 96.* Published annually.

Bruun P. *Port engineering.* 3rd Edition. Houston, Gulf Publishing Co, 1981.

Cornick H F. *Dock and harbour engineering, Vols 1–4.* London, Charles Griffin & Co Ltd, 1958.

Cossons N. *The BP book of industrial archaeology.* David and Charles, 1993.

Cunningham B. *Dock engineering.* 3rd Edition. London, Charles Griffin and Co Ltd, 1922.

Cunningham B. *Cargo handling at ports.* London, Charles Griffin and Co Ltd, 1923.

Lord J A, Mudd I G and Williams G J. *Western Dock and Hermitage Basin reclamation, London Docks.* In: Proceedings of ICE Conference on Building on Marginal and Derelict Land. London, Thomas Telford, 1986.

Luck R C. *Development on the infilled Cardiff Bute West Dock: A short case study.* In: Proceedings of International Conference on Construction on Polluted and Marginal Land. London, Engineering Technics Press, 1990.

Pope R (Editor). *Atlas of British social and economic history – since c1700.* London, Routledge, 1989.

Vernon-Hardcourt L F. *Harbours and docks – their physical features, history, construction, equipment and maintenance.* Oxford, Clarendon Press, 1885.

United Kingdom legislation relating to marine pollution:

The Merchant Shipping (Prevention and Control of Pollution) Order 1990. Statutory Instrument No 2595/1990. London, HMSO, 1990.

The Merchant Shipping (Control of Pollution by Noxious Liquid Substances in Bulk) (Amendment) Regulations 1990. Statutory Instrument No 2604/1990. London, HMSO, 1990.

The Merchant Shipping/Dangerous Goods and Marine Pollutants) Regulations 1990. Statutory Instrument No 2605/1990. London, HMSO, 1990.

Case study including information relevant to this Industry Profile:

Paul V. *Bibliography of case studies on contaminated land: investigation, remediation and redevelopment.* Garston, Building Research Establishment, 1995.

Information on researching the history of sites may be found in:

Department of the Environment. *Documentary research on industrial sites.* DOE, 1994.

4.3 Related DOE Industry Profiles

Animal and animal products processing works
Chemical works: coatings (paints and printing inks) manufacturing works
Engineering works: shipbuilding, repair and shipbreaking (including naval shipyards)
Gas works, coke works and other coal carbonisation plants
Metal manufacturing, refining and finishing works: electroplating and other metal finishing works
Metal manufacturing, refining and finishing works: iron and steelworks
Metal manufacturing, refining and finishing works: non-ferrous metal works (excluding lead works)
Power stations (excluding nuclear power stations)
Railway land
Timber treatment works
Waste recycling, treatment and disposal sites: drum and tank cleaning and recycling plants
Waste recycling, treatment and disposal sites: landfills and other waste treatment or waste disposal sites

4.4 Health, safety and environmental risks

The Control of Substances Hazardous to Health (COSHH) Regulations 1994 and the Management of Health and Safety at Work Regulations 1992 are available from

HMSO. Information on relevant health and safety legislation and approved codes of practice published by HSE publications are available from Health and Safety Executive Books, PO Box 1999, Sudbury, Suffolk, CO10 6FS (telephone 01787 881165), as well as HMSO and other retailers.

Information on the health, safety and environmental hazards associated with individual contaminants mentioned in this profile may be obtained from the following sources:

Health and Safety Executive. *Transport, handling and storage of dangerous substances in port areas.* London, HMSO, 1983.

Health and Safety Executive. *A guide to the dangerous substances in harbour areas regulations 1987.* Health and Safety Series Booklet HS(R)27, London, HMSO, 1988.

Howard P H. *Handbook of environmental fate and exposure data for organic chemicals.* Vols I and II. USA, Lewis Publishers, 1990.

Sax N and Lewis R. *Hazardous chemicals desk reference.* New York, Van Nostrand Reinhold Company, 1987.

Verschueren K. *Handbook of environmental data on organic chemicals.* 2nd Edition. New York, Van Nostrand Reinhold Company, 1983.

4.5 Waste disposal and remediation options

Useful information may be obtained from the Department of the Environment series of Waste Management Papers, which contain details of the nature of industrial waste arisings, their treatment and disposal. A current list of titles in this series is available from HMSO Publications Centre, PO Box 276, London, SW8 5DT.

Publications containing information on the treatment options available for the remediation of contaminated land sites, prepared with the support of the Department of the Environment's Research Programme, can be obtained from National Environmental Technology Centre Library, F6, Culham, Abingdon, Oxfordshire, OX14 3DB.

A full list of current titles of Government publications on all aspects of contaminated land can be obtained from CLL Division, Room A323, Department of the Environment, Romney House, 43 Marsham Street, London, SW1P 3PY.

Advice on the assessment and remediation of contaminated land is contained in guidance published by the Construction Industry Research and Information Association (CIRIA), 6 Storey's Gate, Westminster, London, SW1P 3AU.

Annex Potential contaminants

The chemical compounds and other materials listed below generally reflect those associated with the industry and which have the potential to contaminate the ground. The list is not exhaustive; neither does it imply that all these chemicals might be present nor that they have caused contamination.

Dock construction and development

Source of contaminant

Examples of potential contaminants

Construction on top of peat and other natural organic materials or putrescible waste

methane
carbon dioxide
hydrogen sulphide

Site infill prior to (re)development with waste material from power stations, brick kilns, ore processing, demolition of buildings or other local industries

metals and metalloids
phenols
chlorides
sulphates
sulphides
polycyclic aromatic hydrocarbons (PAHs)
coal/coke
asbestos
cyanides

Dredgings

metals and metalloids
eg lead
zinc
cadmium
copper
chromium
tin
arsenic
mercury
nickel
molybdenum
antimony
beryllium
oils

Cargo handling and storage

Cargo/operation	Source of contamination	Examples of potential contaminants
Coal/coke	Cargo spillage Storage yard spillage Coal carbonisation plants (see ancillary activities)	metals and metalloids sulphates sulphides cyanides
Petroleum products	Cargo spillage Fuel and cargo storage yard spillage Fuel waste spillage Tank cleaning installations Hydraulic equipment	diesel petrol mineral oils phenols aliphatic, alicyclic and aromatic hydrocarbons dispersing agents
Metal ores	Cargo spillage Transport/handling/storage	metals and metalloids (including radioactive species) sulphates sulphides
Timber products	Storage/ancillary treatment facilities	pesticides preservatives eg copper-chrome- arsenic (CCA) creosote
Leather and other animal products	Storage/ancillary treatment facilities	pesticides
Grain and other food products	Galley waste Cargo spillage Transport/handling/storage	excess nutrients pesticides
Storage facilities warehousing	Storage/spillage Waste disposal	asbestos (sheet and sprayed)
Maintenance operations	Storage/spillage Waste disposal	cleaning agents paint residues solvents (halogenated organics) metals and metalloids hydraulic fluids
Refrigerated store.	Storage/spillage Waste disposal	refrigerating agents eg sodium hydroxide calcium chloride brine CFC compounds

Ancillary industrial activities

Source of contaminant	Examples of potential contaminants
Timber protection and treatment for ships and buildings/structures	pesticides eg copper-chrome-arsenic (CCA) creosote
Tank cleaning	detergents solvents diesel petrol mineral oil
Rope and hemp works Sail and canvas making	coal tars polycyclic aromatic hydrocarbons (PAHs) phenols
Electricity substations/transformers	polychlorinated biphenyls (PCBs)
Gas works/coal carbonisation plants Shipbuilding and breaking Ship repair and maintenance Iron and brass foundries Copper and steel shops Metal finishing and plating shops Paint shops including antirust/ antifouling protection	Refer to the relevant Industry Profile (see Section 4) for potential contaminants



Recycled paper

DOE Industry Profiles

Airports
Animal and animal products processing works
Asbestos manufacturing works
Ceramics, cement and asphalt manufacturing works
Chemical works: coatings (paints and printing inks) manufacturing works
Chemical works: cosmetics and toiletries manufacturing works
Chemical works: disinfectants manufacturing works
Chemical works: explosives, propellants and pyrotechnics manufacturing works
Chemical works: fertiliser manufacturing works
Chemical works: fine chemicals manufacturing works
Chemical works: inorganic chemicals manufacturing works
Chemical works: linoleum, vinyl and bitumen-based floor covering manufacturing works
Chemical works: mastics, sealants, adhesives and roofing felt manufacturing works
Chemical works: organic chemicals manufacturing works
Chemical works: pesticides manufacturing works
Chemical works: pharmaceuticals manufacturing works
Chemical works: rubber processing works (including works manufacturing tyres or other rubber products)
Chemical works: soap and detergent manufacturing works
Dockyards and dockland
Engineering works: aircraft manufacturing works
Engineering works: electrical and electronic equipment manufacturing works (including works manufacturing equipment containing PCBs)
Engineering works: mechanical engineering and ordnance works
Engineering works: railway engineering works
Engineering works: shipbuilding, repair and shipbreaking (including naval shipyards)
Engineering works: vehicle manufacturing works
Gas works, coke works and other coal carbonisation plants
Metal manufacturing, refining and finishing works: electroplating and other metal finishing works
Metal manufacturing, refining and finishing works: iron and steelworks
Metal manufacturing, refining and finishing works: lead works
Metal manufacturing, refining and finishing works: non-ferrous metal works (excluding lead works)
Metal manufacturing, refining and finishing works: precious metal recovery works
Oil refineries and bulk storage of crude oil and petroleum products
Power stations (excluding nuclear power stations)
Pulp and paper manufacturing works
Railway land
Road vehicle fuelling, service and repair: garages and filling stations
Road vehicle fuelling, service and repair: transport and haulage centres
Sewage works and sewage farms
Textile works and dye works
Timber products manufacturing works
Timber treatment works
Waste recycling, treatment and disposal sites: drum and tank cleaning and recycling plants
Waste recycling, treatment and disposal sites: hazardous waste treatment plants
Waste recycling, treatment and disposal sites: landfills and other waste treatment or waste disposal sites
Waste recycling, treatment and disposal sites: metal recycling sites
Waste recycling, treatment and disposal sites: solvent recovery works
Profile of miscellaneous industries incorporating:
Charcoal works
Dry-cleaners
Fibreglass and fibreglass resins manufacturing works
Glass manufacturing works
Photographic processing industry
Printing and bookbinding works

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Government Buildings,
Lime Grove,
Ruislip, HA4 8SF

Price £10

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